APPLICATION TOOL FOR MULTIPLE WIDTH FILMS

Field of the Invention

The present invention relates to processes and apparatus for applying an adhesive-backed film or tape on the outer face of, for example, automobile door window frames or sashes and, wherein, the film or tape comprises multiple widths.

Background of the Invention

A thin film or tape may be applied to the surface of an article to provide the article with a favorable design. It is known in the art that it is difficult to precisely position and adhere an adhesive-backed film onto an article. Further, it is difficult to apply the film without air becoming entrapped between the film and the article during the application process. It is also noted that if the step of applying the film is not continuous, a line mark (a shock line) may be formed in the film. Such a shock line impairs the external appearance of the film/article combination.

Some automobile assembly lines apply a thin film (e.g., a narrow width paint replacement film) onto automobile surfaces. More specifically, for example, a black adhesive tape (i.e., an adhesive-backed paint replacement film) may be applied to a vehicle sash so as to improve the appearance of the vehicle. The black adhesive tape, for example, comprises a film layer (made of vinyl chloride, for example) as a substrate and an adhesive layer (an acrylic-type pressure sensitive adhesive, for example) provided on the backside of the film layer.

It would be desirable to have a tool and related process for applying an adhesive-backed film having multiple widths, e.g., a first section having a first width and a second section having a second width, such that the multiple width film may be applied without shock lines resulting in the applied film or air becoming trapped between the film and the article.

Summary of the Invention

In accordance with the present invention, a tool and related process are provided for applying an adhesive-backed film or tape (e.g., die cut shapes of blackout film or tape) having multiple widths, e.g., a first section having a first width and a second section

having a second width, to the outer face of, for example, an automobile door window frame or sash.

In accordance with a first aspect of the present invention, an adhesive-backed film application tool is provided for applying an adhesive-backed film to a first surface of an adherend. The adherend further includes a second surface. The tool comprises: a directing structure adapted to engage the second surface of the adherend; an application structure pivotably coupled to the directing structure; and an element for biasing the directing and application structures toward one another such that the directing and application structures are capable of being releasably clamped to the adherend. The application structure includes at least one element for applying the adhesive-backed film to the first surface and guide structure for properly locating the adhesive-backed film relative to the applying element and the first surface. The guide structure has a movable guide surface capable of being located in a first position corresponding to a first dimension of the adhesive-backed film and a second position corresponding to a second dimension of the adhesive-backed film.

In accordance with a second aspect of the present invention, an adhesive-backed film application tool is provided for applying an adhesive-backed film having at least first and second widths to a first surface of a sash. The sash further includes a second surface. The tool comprises: a directing structure adapted to engage the second surface of the sash; an application structure pivotably coupled to the directing structure; and an element for biasing the directing and application structures toward one another such that the directing and application structures are capable of being releasably clamped to the sash. The application structure includes at least one rotatable element for applying the adhesive-backed film to the first surface and guide structure for properly locating the adhesive-backed film relative to the rotatable element and the first surface. The guide structure has a movable guide surface capable of being located in a first position corresponding to the first width of the adhesive-backed film and a second position corresponding to the second width of the adhesive-backed film.

In accordance with a third aspect of the present invention, a process is provided for applying an adhesive-backed film having a first section with a first width and a second section with a second width to a first surface of a sash. The process comprises the steps of: clamping an adhesive-backed film application tool to the sash; and applying the

adhesive-backed film to the first surface of the sash via at least one rotatable element of the tool. The tool includes a movable guide surface capable of being located in a first position corresponding to the first width of the adhesive-backed film and a second position corresponding to the second width of the adhesive-backed film. The process further comprises moving the guide surface from the first position to the second position approximately when the second section of the adhesive-backed film is to be applied to the sash first surface. The moving step may be conducted manually. Alternatively, the moving step may be effected automatically.

Brief Description of the Drawings

Fig. 1 is a side view of a tool constructed in accordance with a first embodiment of the present invention illustrating directing and application structures separated from one another just before the tool is clamped to a sash;

Fig. 2 is a side view of the tool of Fig. 1 illustrating the tool clamped to the sash and further illustrating a movable guide surface in a first position;

Fig. 2A is a view illustrating guide roller assemblies of the tool of Fig. 1 and the manner in which the rollers of those assemblies are positioned relative to a projecting rib of a sash;

Fig. 3 is a side view of the tool illustrated in Fig. 1 illustrating the tool clamped to the sash and further illustrating the movable guide surface in a second position;

Fig. 4 is a side view of a film to be applied by the tool of Fig. 1 to a sash;

Fig. 4A is a side view of a release liner adapted to be joined to the film prior to the film being adhered to a sash;

Fig. 5 is a perspective view of a portion of a sash to which a film may be applied by the tool of Fig. 1;

Fig. 6 is a side view of a door including the sash of Fig. 5;

Fig. 7 is an exploded view of the directing structure of the tool of Fig. 1;

Fig. 8 is an exploded view of the application structure of the tool of Fig. 1;

Fig. 9 is a side view similar to Fig. 2 but illustrating an opposite side of the tool;

Fig. 10 is a top view of the tool of Fig. 1 with the lever removed;

Fig. 11 is a schematic view illustrating the application of a film to a sash by application rollers of the tool of Fig. 1;

Fig. 11A is a view illustrating an initial portion of a film first section adhered to a beginning portion of a sash outer surface;

Fig. 11B is a schematic view illustrating the tool 10 moving backwards so as to allow an edge of a liner second section to separate from the film;

Fig. 12 is a view illustrating a movable guide plate engaging a corner on a sash such that the corner applies an upward force to the movable guide plate and wherein an outer guide and an operator-gripping member have been removed;

Fig. 13 is a side view of a tool constructed in accordance with a second embodiment of the present invention for applying an adhesive backed film to a sash and having a movable guide surface in a second position and with a portion of a lever removed;

Fig. 14 is a side view of the tool of Fig. 13 illustrating the movable guide surface in a first position;

Fig. 15 is a side view similar to Fig. 13 but illustrating an opposite side of the tool;

Fig. 16 is a view of a first end of the tool of Fig. 13;

Fig. 17 is a view of a second end of the tool of Fig. 13; and

Fig. 18 is an exploded view of the application structure of the tool of Fig. 13.

Detailed Description of the Invention

Illustrated in Figs. 1-3 is a tool 10 constructed in accordance with a first embodiment of the present invention for applying an adhesive backed film or tape 100 having multiple widths to an outer face of an adherend. The film 100 is illustrated in Fig. 4, but is not shown in Figs. 1-3. In the illustrated embodiment, the film 100 comprises a first section 102 having a first width W_1 and a second section 104 having a second width W_2, which is greater in dimension than the first width W_1. Also in the illustrated embodiment, the adherend comprises a vehicle door frame or sash 200 having an outer, first surface 202 and an inner, second surface 204, see Fig. 5. The sash 200 further includes a projecting rib 206, which extends along the length of the sash 200 and to which a weather strip (not shown) is attached. As illustrated in Fig. 6, the sash 200 includes first and second substantially straight outer surface portions 210a and 210b and an angled outer surface portion 212. The second portion 210b has a width greater than the width of the first portion 210a. The angled portion 212 has an outer corner 212a. The film first section

102 may be adhered to the sash first portion 210a, while the film second section 104 may be adhered to the sash second portion 210b.

The tool 10 comprises a directing structure 20 pivotably coupled to an application structure 30, see Figs. 1-3, 7 and 8. The directing and application structures 20 and 30 are pivotably coupled together via a pin 123. A retainer clip 123a coupled to an end 123b of the pin 123 maintains the pin 123 in position relative to the directing and application structures 20 and 30. As will be discussed further below, a spring 40 is provided for biasing the directing and application structures 20 and 30 toward one another such that the tool 10 can be releasably clamped to the sash 200, see Figs. 1, 2, 7 and 10.

The directing structure 20 comprises a pivot block 22, see Fig. 7, where elements comprising the directing structure 20 are illustrated in exploded format. A grip block 24, having a tapered upper surface 24a, is mounted to an upper surface 22a of the pivot block 22. The grip block 24 includes a pair of recesses 24b, each sized to receive one of a pair of gussets 22c provided on the pivot block 22. A wheel block 26 is mounted to a lower surface 22b of the pivot block 22. Bolts 23 pass through bores in the grip block 24 and the pivot block 22 and are threadedly received in tapped openings in the wheel block 26. Three wheel assemblies 28 are provided, each including a wheel 28a, a bearing/hub structure 28b and a bolt 28c. The bolts 28c extend from the bearing/hub structures 28b and are received in corresponding tapped openings in the wheel block 26. As is apparent from Figs. 2-3, the wheels 28a move along an edge portion 204a of the sash inner surface 204 and assist in stabilizing the tool 10 on the sash 200.

The directing structure 20 further comprises a flange roller mounting block 120, which is coupled to the pivot block 22 via bolts 121. The bolts 121 pass through bores in the pivot block 22 and are threadedly received in tapped openings in the mounting block 120. First, second and third flange guide roller assemblies 130-132 are coupled to the mounting block 120. Each guide roller assembly 130-132 comprises a corresponding roller 130a-132a, a corresponding bearing 130b-132b, a corresponding bearing spacer 130c-132c and a corresponding bolt 130d-132d. The bolts 130d-132d pass through the bearings 130b-132b, the rollers 130a-132a and the bearing spacers 130c-132c and are received in tapped openings provided in the mounting block 120. The rollers 130a and 132a of the first and third assemblies 130 and 132 have flanges 130e and 132e, which are similar in shape and size and engage a first side 206a of the projecting rib 206, while the

roller 131a of the second assembly 131 has a flange 131e which engages a second side 206b of the projecting rib 206, see Fig. 2A. By engaging opposing sides 206a, 206b of the projecting rib 206, the flanges 130e-132e help mount the tool 10 to the sash 200 and further help guide the tool 10 as it is manually moved along the length of the sash 200 so as to apply a film 100 to the sash first surface 202. A discussion of similar guide roller assemblies is set out in International Publication WO 03/091139 A1, published on November 6, 2003, which is incorporated herein by reference in its entirety, based on International Application No. PCT/US03/09263, filed March 27, 2003, entitled ADHESIVE TAPE APPLICATION TOOL, which is incorporated herein by reference in its entirety, and which, in turn, is based on Japanese priority patent application number 2002-123403 filed April 25, 2002.

The directing structure 20 still further comprises a lever 140 and a lever spacer block 150. Bolts 160 pass through corresponding bores in the lever 140 and lever spacer block 150 and are threadedly received in corresponding tapped bores in the pivot block 22.

The application structure 30 comprises a main body 32 and a lower guide 34, see Fig. 8, where elements comprising the application structure 30 are illustrated in exploded format. The main body 32 includes first and second projections 32a, 32b, a generally cylindrical projection 32c and downwardly extending arms 32d and 32e, see also Figs. 2 and 9. A first axle 34a is positioned between the projection 32a and the lower guide 34, a second axle 34b is positioned between the projection 32b and the lower guide 34, and a third axle 34c is positioned between the cylindrical projection 32c and the lower guide 34. Bolts 35a pass through corresponding openings in the main body 32 and threadedly engage corresponding tapped openings in the axles 34a-34c. Bolts 35b pass through corresponding openings in the lower guide 34 and threadedly engage corresponding tapped openings in the axles 34a-34c. The axles 34a-34c do not rotate relative to the main body 32 and the lower guide 34. A roller core 36a-36c is fitted over each axle 34a-34c and rotates relative to its axle. An application roller 37a comprising a generally cylindrical foam member is fitted over core 36a so as to rotate with the core 36a. Similarly, an application roller 37b is fitted over core 36b so as to rotate with the core 36b. The application rollers 37a and 37b function as applying elements for pressing the adhesive-backed film 100 again the first surface 202 of the sash 200 during a film application operation.

A pin 38 is inserted into an opening in the main body 32 and an opening in the lower guide 34, see Figs. 1 and 8. A set screw 38b holds the pin 38 in the main body 32. A generally cylindrical sleeve 38a made, for example, from a polymeric material, is fitted over the pin 38 and rotates relative to the pin 38. The sleeve 38a functions as a rotatable guide for the film 100 just before it is applied to the sash outer surface 202 by the application rollers 37a and 37b. The sleeve 38a also defines a sharp bend in the path along which the film 100 travels. By making a sharp bend at the sleeve 38a, the film 100 releases from a release liner 112, which is provided on the adhesive side of the film 100.

The application structure 30 further comprises a guide structure 160 for properly locating the adhesive-backed film 100 relative to the application rollers 37a, 37b and the sash first surface 202, see Fig. 8. The guide structure 160 comprises a guide assembly 170, which moves relative to the main body 32. The guide assembly 170 comprises a movable guide plate 172 having an inner surface 172a defining a movable guide surface, see Figs. 1-3, an engagement bar 174, first and second slide rods 176a, 176b and a spring 178. The slide rods 176a and 176b pass through corresponding bores in the main body 32 and are fixedly coupled to the engagement bar 174 and the guide plate 172 via bolts 179a and 179b. The spring 178 is received in a recess in the main body 32 and contacts the engagement bar 174 so as to bias the guide assembly 170 to a second location, illustrated in Fig. 3, such that the movable guide surface 172a is located in a second position, which, as will be discussed below, corresponds to the second width W_2 of the film 100.

The guide structure 160 further comprises a pair of first magnetic elements 180 fixedly mounted in the main body 32 and a pair of second magnetic elements 182 fixedly mounted in the engagement bar 174. One or more of the magnetic elements 180, 182 may be replaced by a steel screw or bolt. The first and second magnetic elements 180 and 182 function to releasably couple the engagement bar 174 to the main body 32 when the guide assembly 170 is moved to a first location, illustrated in Figs. 1 and 2, where the movable guide surface 172a is located in a first position, which, as will be discussed below, corresponds to the first width W_1 of the film 100. It is further contemplated that first and second mechanical connector elements may be provided in place of magnets 180 and 182. For example, hook and loop sections, such as Velcro (Trademark), may be provided on the main body 32 and the engagement bar 174 to releasably couple the engagement bar 174 to the main body 32 when the guide assembly 170 is moved to the first location. It is further

contemplated that a conventional first connector element (not shown) such as a first leg may be provided on one of the main body 32 and the engagement bar 174 for being releasably received between second and third legs, spring-biased together, and defining a second connector element (not shown) provided on the other of the main body 32 and the engagement bar 174 to releasably couple the engagement bar 174 to the main body 32 when the guide assembly 170 is moved to the first location.

The guide structure 160 still further comprises a fixed guide surface 34a defined by an inner surface of the lower guide plate 34, which is spaced from and fixed in position relative to the main body 32. As is illustrated in Figs. 1 and 2, the fixed guide surface 34a is spaced from the movable guide surface 172a by a distance substantially equal to the first width W_1 of the film 100 when the movable guide surface 172a is located in its first position. As illustrated in Fig. 3, the fixed guide surface 34a is spaced from the movable guide surface 172a by a distance substantially equal to the second width W_2 of the film 100 when the movable guide surface 172a is located in its second position.

The guide structure 160 also comprises an outer guide 190, which is spaced from the application rollers 37a and 37b so as to define a gap G for receiving the film 100 and the accompanying release liner 112. The guide 190 is coupled to the main body 32 via bolts 190a. An operator-gripping member 192 is fixedly coupled to the outer guide 190 via bolts 194.

The first and second projections 32a, 32b on the main body 32 have rounded portions facing the outer guide 190 so as to have shapes corresponding to the outer peripheries of the application rollers 37a and 37b.

Application of the film 100 to the sash 200 via the tool 10 is effected as follows. As noted above and as illustrated in Fig. 11, a release liner 112 is provided on the adhesive side of the film 100. A score line 112a is provided in the release liner approximately 3 inches from a start edge 112b of the liner 112 so as to separate the liner into first and second sections 112c and 112d, see Fig. 4A. Initially, an operator manually removes the first section 112c of the release liner 112 from the film 100 such that the adhesive on an initial portion 102a of the film first section 102 is exposed. The operator then adheres the exposed adhesive-coated side of the initial film portion 102a to a corresponding beginning portion 202a of the outer surface 202 of the sash 200, see Fig. 11A.

Once the initial portion 102a of the film 100 has been adhered to the sash 200, the tool 10 is mounted to the sash 200 and over a portion of the film 100 having the release liner second section 112d adhered to it. To mount the tool 10 to the sash 200, the operator applies pressure to the lever 140 and outer gripping member 192 so as to separate the directing structure 20 from the application structure 30. The separated structures 20 and 30 are positioned over the sash 200 as illustrated in Fig. 1. The operator then releases pressure on the lever 140 and the outer gripping member 192 such that the directing and application structures 20 and 30 are clamped to the sash 200 with the rollers 130a-132a engaging the projecting rib 206 as illustrated in Fig. 2A.

With the tool 10 mounted to the sash 200, the operator threads the film 100 having the release liner second section 112d attached to it around the cylindrical sleeve 38a and through the gap G between the outer guide 190 and the application rollers 37a and 37b. When so positioned, the release liner second section 112d faces the outer guide 190 while the film 100 faces the application rollers 37a and 37b. The tool 10 is then moved backwards in the direction of arrow 3 in Fig. 11B until an edge 112e of the liner second section 112d has separated from the film 100, see Figs. 11B and 11. As the tool 10 is moved in the direction of arrow 3, an operator may have to pull the film 100/second section 112d in the direction of arrow 3 so as to take up slack in the film 100/second section 112d. Separation of the liner second section edge 112e typically occurs without operator intervention when the edge 112e has move at least to the position where it has traveled past the sleeve 38a. Once separation has occurred, the tool 10 is manually moved in the direction of arrow 5 in Fig. 11 so as to apply the film 100 to the sash 200. As the tool 10 moves in the direction of arrow 5, the release liner second section 112d continues to separate from the film 100. The film 100 is adhered to the sash outer surface 200 via pressure applied to the film 100 by the application rollers 37a and 37b.

In the embodiment illustrated in Figs. 1-3, when the operator applies pressure to the lever 140 and the outer gripping member 192, a bottom surface 140a of the lever 140 engages a top surface 174a of the engagement bar 174 so as to apply a downward force onto the engagement bar 174 such that it moves toward the main body 32, see Fig. 1. When the engagement bar 174 nears the main body 32, the magnetic elements 180 and 182 attract one another resulting in the engagement bar 174 being moved into engagement with the main body 32 such that the guide assembly 170 is in its first location, see Figs. 1

and 2. The magnetic elements 180 and 182 then function to releasably couple the engagement bar 174 to the main body 32. As noted above, when the guide assembly 170 is positioned in its first location, the movable guide surface 172a is located in its first position. As also noted above, when the movable guide surface 172a is in its first position, it is separated from the fixed guide surface 34a by a distance substantially equal to the first width W_1 of the film 100. When so positioned, the movable guide surface 172a and the fixed guide surface 34a function to properly locate the first section 102 of the film 100 relative to the application rollers 37a and 37b and the sash outer surface 202 as the film first section 102 travels through the gap G and is applied to the sash 200.

As noted above, the second section 104 of the film 100 has a second width W_2 greater than the first width W_1 of the film first section 102. Just before the film second section 104 is to be adhered to the sash outer surface 202, an extending portion 172b of the movable guide plate 172 engages the outer corner 212a of the sash angled portion 212, see Figs. 6 and 12. With regard to the example sash 200 illustrated in Fig. 6, when the tool 10 has rotated at the corner 212a approximately 10 degrees to about 15 degrees from a horizontal axis 213, i.e., as it moves from the first substantially straight outer portion 210a to the second substantially straight outer portion 210b, the extending portion 172b engages the outer corner 212a. The outer corner 212a applies an upward force to the movable guide plate 172 sufficient to overcome the attractive forces generated by the magnetic elements 182 and 184 such that the movable guide plate 172 is moved toward the main body 32 while the engagement bar 174 is moved away from the main body 32, see Fig. 12. The spring 178 then acts to return the guide assembly 170 to its second location. As noted above, when the guide assembly 170 is in its second location, the movable guide surface 172a is in its second position, see Fig. 3, such that it is separated from the fixed guide surface 34a by a distance substantially equal to the second width W_2 of the film 100. When so positioned, the movable guide surface 172a and the fixed guide surface 34a function to properly locate the second section 104 of the film 100 relative to the application rollers 37a and 37b and the sash outer surface 202 as the film second section 104 travels through the gap G and is applied to the sash 200.

In the illustrated embodiment, the shape of the adhesive backed film 100 is made so as to have widths W_1 and W_2 greater than corresponding widths of the sash first and second outer surface portions 210a and 210b. After the tool 10 has applied the film 100,

the extra width of the film 100 projects out from the edges of the sash 200, parallel to the outer surface 202 of the sash 200. This projecting film is later manually wrapped around the edges of the sash 200 and adhered to the second surface 204 of the sash 200. It is also contemplated that the shape of the adhesive backed film 100 may be made so as to have widths W_1 and W_2 substantially equal to the corresponding widths of the sash first and second outer surface portions 210a and 210b.

A tool 500, constructed in accordance with a second embodiment of the present invention for applying an adhesive-backed film or tape 100 having multiple widths to an outer face of an adherend, is illustrated in Fig. 13, where like elements are referenced by like numerals.

The tool 500 comprises a directing structure 520 pivotably coupled to an application structure 530, see Figs. 13 and 14. The directing and application structures 520 and 530 are pivotably coupled together via a pin 523. A retainer clip 523a coupled to an end of the pin 523 maintains the pin 523 in position relative to the directing and application structures 520 and 530. A spring 40, see Fig. 17, is provided for biasing the directing and application structures 520 and 530 toward one another such that the tool 500 can be releasably clamped to a sash 200, such as the one illustrated in Figs. 5 and 6.

The directing structure 520 is constructed in essentially the same manner as the directing structure 20 of the embodiment of Figs. 1-3, except for the following modifications. The directing structure 520 does not include a grip block 24, see Figs. 13 and 14. Nor does the directing structure 520 include a lever spacer block 150, see Figs. 13, 14 and 17. Rather, the lever 540 is mounted directly to the pivot block 22 via bolts (not shown). Further, the lever 540 is provided with a first bore (not shown) for receiving a spring 678 and a second bore 540b for receiving a first slide rod 676.

The application structure 530 comprises a main body 532 and a lower guide 534, see Fig. 18, where elements comprising the application structure 530 are illustrated in exploded format. The main body 532 includes first and second projections 532a, 532b, a generally cylindrical projection 532c and downwardly extending arms 532d and 532e, see also Figs. 13 and 17. A first axle 34a is positioned between the projection 532a and the lower guide 534, a second axle 34b is positioned between the projection 532b and the lower guide 534, and a third axle 34c is positioned between the cylindrical projection 532c and the lower guide 534. Bolts 35a pass through corresponding openings in the main body

532 and threadedly engage corresponding tapped openings in the axles 34a-34c. Bolts 35b pass through corresponding openings in the lower guide 534 and threadedly engage corresponding tapped openings in the axles 34a-34c. The axles 34a-34c do not rotate relative to the main body 532 and the lower guide 534. A roller core 36a-36c is fitted over each axle 34a-34c and rotates relative to its axle. An application roller 37a comprising a generally cylindrical foam member is fitted over core 36a so as to rotate with the core 36a. Similarly, an application roller 37b is fitted over core 36b so as to rotate with the core 36b. The application rollers 37a and 37b function as applying elements for pressing the adhesive-backed film 100 again the first surface 202 of the sash 200 during a film application operation.

A pin 38 is inserted into an opening in the main body 532 and an opening in the lower guide 534, see Fig. 14. A set screw 38b holds the pin 38 in the main body 532. A generally cylindrical sleeve 38a made, for example, from a polymeric material, is fitted over the pin 38 and rotates relative to the pin 38. The sleeve 38a functions as a rotatable guide for the film 100 just before it is applied to the sash outer surface 202 by the application rollers 37a and 37b.

The application structure 530 further comprises a guide structure 660 for properly locating the adhesive-backed film 100 relative to the application rollers 37a, 37b and the sash first surface 202, see Fig. 18. The guide structure 660 comprises a guide assembly 670, which is manually movable relative to the main body 532. The guide assembly 670 comprises a movable guide plate 672 having an inner surface 672a defining a movable guide surface, see Figs. 13 and 14, an engagement bar 674, first and second slide rods 676 and 677 and a spring 678. As noted above, the first slide rod 676 passes through the bore 540b in the lever 540. As is apparent from Fig. 16, the second slide rod 677 does not pass through a bore in the lever 540.

The first slide rod 676 has a first portion 676a having a first diameter and a second portion 676b having a second diameter which is smaller than the first diameter such that a stepped portion 676c is defined where the first and second portions 676a and 676b meet. The second portion 676b also passes through a first bore (not shown) in the main body 532, which bore is sized so as to be only slightly larger than the second diameter of the second portion 676b, but is smaller than the first diameter of the first portion 676a. Hence, the portion of the main body 532 surrounding the main body first bore defines a stop or

limit surface which limits the movement of the first slide rod 676 relative to the main body 532.

The second slide rod 677 has a third portion 677a having a third diameter and a fourth portion 677b having a fourth diameter which is smaller than the third diameter such that a stepped portion 677c is defined where the third and fourth portions 677a and 677b meet. The fourth portion 677b passes through a second bore (not shown) in the main body 532, which bore is sized so as to be only slightly larger than the fourth diameter of the fourth portion 677b, but is smaller than the third diameter of the third portion 677a. Hence, the portion of the main body 532 surrounding the main body second bore defines a stop or limit surface which limits the movement of the second slide rod 677 relative to the main body 532.

The slide rods 676 and 677 are fixedly coupled to the engagement bar 674 and the guide plate 672 via bolts 675. The spring 678 is received in a recess in the main body 532, passes through a bore in the lever 540 and contacts the engagement bar 674 so as to bias the guide assembly 670 to a second location, illustrated in Fig. 13, such that the movable guide surface 672a is located in a second position, which corresponds to the second width W_2 of the film 100.

An operator may press down on the engagement bar 674, as designated by arrow 705 in Fig. 14, so as to move the guide assembly 670 against the upward bias force of the spring 40 to a first location, illustrated in Fig. 14, where the movable guide surface 672a is located in a first position, which corresponds to the first width W_1 of the film 100. The first location of the guide assembly 670 is defined by the slide rod stepped portions 676c and 677c engaging the limit surfaces of the main body 532 surrounding the main body first and second bores.

The guide structure 660 still further comprises a fixed guide surface 534a defined by an inner surface of the lower guide plate 534, which is spaced from and fixed in position relative to the main body 532, see Figs. 13 and 17. As is illustrated in Fig. 14, the fixed guide surface 534a is spaced from the movable guide surface 672a by a distance substantially equal to the first width W_1 of the film 100 when the movable guide surface 672a is located in its first position. As illustrated in Fig. 13, the fixed guide surface 534a is spaced from the movable guide surface 672a by a distance substantially equal to the

second width W_2 of the film 100 when the movable guide surface 672a is located in its second position.

The guide structure 660 also comprises an outer guide 690, which is spaced from the application rollers 37a and 37b so as to define a gap G for receiving the film 100 and an accompanying release liner 112. The guide 690 is coupled to the main body 32 via bolts 190a. An operator-gripping member 692 is coupled to the outer guide 690 via bolts (not shown).

Application of the film 100 to the sash 200 via the tool 500 is effected as follows. As discussed above with regard to tool 10, an operator manually removes the first section 112c of the release liner 112 from the film 100 such that the adhesive on an initial portion 102a of the film first section 102 is exposed. The operator then adheres the exposed initial film portion 102a to a corresponding beginning portion 202a of the outer surface 202 of the sash 200, see Fig. 11A.

Once the initial portion 102a of the film 100 has been adhered to the sash 200, the tool 500 is mounted to the sash 200 and over a portion of the film 100 having the release liner second section 112d adhered to it. To mount the tool 500 to the sash 200, the operator applies pressure to the lever 540 and outer gripping member 692 so as to separate the directing structure 520 from the application structure 530. The separated structures 520 and 530 are positioned over the sash 200. The operator then releases pressure on the lever 540 and the outer gripping member 692 such that the directing and application structures 520 and 530 are clamped to the sash 200 with the rollers 130a-132a engaging the projecting rib 206 as illustrated in Fig. 2A.

With the tool 500 mounted to the sash 200, the operator threads the film 100 having the release liner second section 112d attached to it around the cylindrical sleeve 38a and through the gap G between the outer guide 690 and the application rollers 37a and 37b. When so positioned, the release liner second section 112d faces the outer guide 690 while the film 100 faces the application rollers 37a and 37b. The tool 500 is then moved backwards, i.e., towards the beginning portion 202a of the sash outer surface 202, until an edge 112e of the liner second section 112d has separated from the film 100. As the tool 500 is moved backwards, an operator may have to pull the film 100/second section 112d in the direction of movement of the tool 500 so as to take up slack in the film 100/second section 112d. Separation of the liner second section edge 112e typically occurs without

operator intervention when the edge 112e has move at least to the position where it has traveled past the sleeve 38a. Once separation has occurred, the tool 500 is manually moved in a direction away from the beginning portion 202a of the sash outer surface 202 so as to apply the film 100 to the sash 200.

In the embodiment illustrated in Figs. 13-15, as the tool 500 is applying the film first section 102 to the sash outer surface 202, an operator must apply a downward force to the engagement bar 674 such that the guide assembly 670 is positioned in its first location. When so positioned, the movable guide surface 672a is located in its first position. As noted above, when the movable guide surface 672a is in its first position, it is separated from the fixed guide surface 534a by a distance substantially equal to the first width W_1 of the film 100. When so positioned, the movable guide surface 672a and the fixed guide surface 534a function to properly locate the first section 102 of the film 100 relative to the application rollers 37a and 37b and the sash outer surface 202 as the film first section 102 travels through the gap G and is applied to the sash 200.

As noted above, the second section 104 of the film 100 has a second width W_2 greater than the first width W_1 of the film first section 102. Just before the film second section 104 is to be adhered to the sash outer surface 202, the operator removes the downward force he/she is applying to the engagement bar 674 such that the spring 678 acts to return the guide assembly 670 to its second location. As noted above, when the guide assembly 670 is in its second location, the movable guide surface 672a is in its second position, see Fig. 13, such that it is separated from the fixed guide surface 534a by a distance substantially equal to the second width W_2 of the film 100. When so positioned, the movable guide surface 672a and the fixed guide surface 534a function to properly locate the second section 104 of the film 100 relative to the application rollers 37a and 37b and the sash outer surface 202 as the film second section 104 travels through the gap G and is applied to the sash 200.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention. For example, it is contemplated that the tools

of the present invention could be used to apply films to articles other than vehicle sashes such as appliances, tools, etc.